

on "The Structure and Habits of Extinct Vertebrate Animals." He had prepared a course for 1856, when, however, lectures were suspended. The Council, it seems, had carped at the long duration of Owen's catalogue-making, and Owen had addressed to them an eloquent *apologia* for his seeming delays. Hence, perhaps, Owen's retirement. In 1863 Thomas Henry Huxley began to lecture, his first course dealing with "The Structure and Development of the Vertebrate Skeleton." His first lecture was devoted to the glyptodon with much-broken carapace, now in the Museum. He continued to deliver a long annual course till succeeded by Flower in 1869. The late Sir William Flower's tenure of the chair, which he shared with the great but somewhat neglected William Kitchen Parker, brings us down to comparatively recent times.

It is as a lecturing body that the College should prove most interesting to the world of Science at large. The names of Owen and the greater Huxley link it with the grand world of Cuvier and Darwin. We might write at length of the beneficent work of the College in pathological anatomy, or serum-therapeutics, a work all the more praiseworthy because it has been sedulously and quietly carried on in despite of the clamours of a stupid section of the public. Of the College examinations it would also be possible to say much. As recently, it should be remembered, as 1860 a doctor could qualify without passing a written examination in medicine. Now, of course, it is scarcely possible, in view of the examinations of the Conjoint Board of the Colleges of Physicians and Surgeons, for any impudent dunderhead to launch himself in practice, and to pocket the fees of a public always a little in love with quackery and mystification. Of the College as a guardian of medical ethics and etiquette, a volume might be written. A hundred years ago the doctor was always satirised by all classes of writers as unscrupulous. Now that charge is only occasionally brought against him by the illiterate, who count for nothing in the long run. That this immense change has been effected is mainly due to the College. And here it is only fair, just reference having been made to the College Museum and Library, to mention the College Office. A long line of secretaries, from Okey Belfour to Mr. Trimmer and Mr. Cowell, have patiently and vigilantly guarded the surgical point of honour. If ever a black sheep has been driven out of the surgical flock it is the College Office that has weighed his demerits and impeached him in the first instance. And this not without deliberation, or, as it was once called, "prayer and fasting." On the other hand, if ever a practitioner has been wrongly accused of malpractice, or unprofessional conduct, it is the College Office that has been at the root of his rehabilitation.

To resume and to conclude—and with the thermometer at 87° it is as well to do so—the surgeon of 1900 is not as his far-off brother of 1800, and the College, in no small degree, has been responsible for the laudable and tremendous transformation. Mere literary men in England have no Academy at their head so drastic and salutary as the College to which surgeons can look up. The doctor in 1800 used occasionally to stipulate, when dealing with workhouse authorities, that he should not be required to treat fever cases. Fever, by the by, in the undrained London of the years prior to Sir John Simon's reforms, was a common cause of death among even the well-to-do. Now, to quote the sestet of an unpublished sonnet,

"To-day skill'd Science runs where bullets hail,  
Or cholera's rife, for love of suffering man,—  
At the laboratory-table seeks  
Plague's grim bacillus, and, if need be, can  
Die as did Müller. Nor shall heroes fail:  
From Hunter on to Lister their fame speaks!"

VICTOR PLARR.

#### ELECTRICAL POWER DISTRIBUTION.

IN a lecture on "Electricity as a Motive Power," delivered to the working men of Sheffield, August 23, 1879, the following question was asked: "And why not now? Why should not the mountain air that has given you workmen of Hallamshire in past times your sinew, your independence of character, blow over your grindstone again? Why should not division of labour be carried to its end, and power be brought to you instead of you to the power? Let us hope then that in the next century electricity may undo whatever harm steam may have done during the present, and that the future workmen of Sheffield, instead of breathing the necessarily impure air of crowded factories, may find himself again on the hill-side, but with electric energy laid on at his command."

The present year sees the dawn of the realisation of this idea of twenty-one years ago. For soon it will no longer be: "If," as I said on that occasion, "a workman could have transmitted to him, just at the time he might require it, a small amount of energy at, say, one halfpenny per hour per horse-power—which would be three or four times the actual cost of production with a very large steam engine—and if he could turn off the power like gas when he did not want it, how many of the smaller workmen of Sheffield would be glad to avail themselves of such a facility?"

To enable such a scheme to be carried out in this country, four Electric Power Distribution Bills have this year been brought before Parliament—one for the county of Durham, one for Tyneside, one for Lancashire, and one for South Wales. And in advocating their second reading on March 1, the President of the Board of Trade expressed the opinion that "the question which the House has to decide is a very important one, perhaps one of the most important ones that have come before the House by means of a private Bill for many years." For he pointed out that "the electrical enterprise of this country is in an exceedingly backward condition," and that:—"It may almost be said that there are villages in North America which are in possession of advantages in connection with electricity which some of our largest towns do not possess."

This opinion was shared by Sir James Kitson and the Committee of the House over which he presided. For from May 3 to well into this month, July, they sat deliberating as to whether, and under what conditions, permission should be given for electric energy to be distributed over nearly 3000 square miles of Great Britain.

A vast amount of evidence was taken regarding the effect on British industry, on the cost of producing manufactured products, and as to the growing up of new factories, and even of new trades, that might come into existence through a general distribution of electric energy. Employer after employer came forward and spoke of his individual need for electrical energy to work scattered tools in his factory, to ventilate and pump his mines, as well as to cut and haul his coal.

"Cheap power is the panacea for the evil effects of foreign competition" was urged again and again by the long stream of manufacturers who occupied the witness box for weeks. The advocates of this cheap power were marshalled in groups like bands of warriors, and, from the various classes of witnesses champions were selected who bombarded the Committee with proofs of the paramount importance of their cause, and overwhelmed the members when they struggled to grasp the arithmetic of "load factors," and begged to know how many Board of Trade units there might be in a horse-power.

At first we recognised many provincial dialects among the crowd in the Committee Room, but when it began to be realised that the inquiry would occupy more weeks than it was at first thought it would need days, the

Northumberland burr was left dominant, and remained so during the whole of May. Then a Lancashire wave rolled in, and it was not until the beginning of the fourth week in June that the "ll" and the "y" formed part of so many of the words that even counsel who had come through the Severn Tunnel to Westminster to plead their cause found some difficulty in pronouncing the names of persons and places.

But the advocates of the universal supply of "electricity in bulk" had not it all their own way, since opposed to them was a band of skirmishers who delivered well-planted criticisms aimed at exposing the grasping character of some of the projects and the desire—not even thinly concealed—of some of the promoters to crush out all small existing systems of electric distribution and to establish huge monopolies for purveying electric energy.

So that one had to moderate the enthusiasm called forth by the near prospect of electric energy being regarded as a public necessity, and therefore being generally distributed like water or gas, with the exercise of a cautious regard for the interests of those undertakers—to use the legal term—who had already been entrusted with spending the money of the ratepayers or of shareholders in establishing electric distribution systems in their own areas. For they contended that this proposal to supply the small and scattered manufacturers with very cheap electric power, which it was alleged would enable them to compete successfully with their more powerful rivals, could not be commercially realised, and that these power distribution schemes had for their object the catching of the popular vote and the passing of Bills which would enable their promoters to pick out those of the customers who were the plums among the consumers already supplied by means of the existing electrical undertakings.

For nine weeks the Committee listened to the arguments *pro* and *con.*, and the tolerance which they showed in patiently hearing questions asked by counsel which had been already asked in their absence and replied to by witnesses who were unaware that the same questions had been answered at length days before, showed how willing the members were to devote their time to a full understanding of the points at issue in order that they might be able to ultimately deliver a sound decision.

The articles of commerce, which we are accustomed to purchase may be divided into those that have weight and volume and those that have not, and it is generally in connection with the former that our system of weights and measures is employed—a pound of mutton, a yard of cloth, four ounces of letter carrying, a thousand cubic feet of gas, a mile of railway journey. But the advance of civilisation has gradually led us to regard as equally suitable for buying and selling other conveniences which it would be far more difficult to meter for the purpose of ascertaining whether we had received our fair supply. A year of police supervision, a length of street improvement, a winter of snow removal, a season of South African campaigning are considered as being furnished at a fair price only when the grumbling in connection with the supply is not too great and the articles in the *Times* are not too severe.

But there remains one commodity which, although it has neither weight, volume, nor linear dimension, can be metered with extreme accuracy, and the public demand for which is daily becoming greater and greater, and that is—energy. Hitherto the working of factories has been associated with water and coal, and either the factories have been built near the stream or in a coal region. When, however, such a site could not be conveniently found, then it has been the custom to carry at a dear rate a black, bulky, dirty substance by rail or water for miles to the factory, and, after strewing a certain portion of its dirt over the neighbourhood in the

form of a descending cloud, to cart the remainder away as dusty ashes.

So accustomed are we to all this—so little does it strike us as incongruous that scuttles full of black lumps should be regularly brought into a drawing-room, no matter how valuable the pictures or rich the curtains and carpets, that we forget that our successors will look with more scorn on our customs than we do on those of our ancestors, seeing that, at least, their floor-coverings of rushes, intermingled with old bones and other refuse, could not be much injured by smoke or by dust.

Electric-lighting, electric-heating, electrically-driven machinery are all undoubtedly clean, but will the two latter pay as well as the former? On this point the evidence before the Committee of the House was somewhat conflicting. What, in fact, is the cost of carrying coal compared with the cost of electrically conveying the energy, or the "essence of the coal" as one of the counsel poetically termed it? Further, what is the saving produced by combining steam-engines, and working one very large engine instead of many small ones at different places?

Briefly, then, apart from all question of dirt, is it cheaper to burn the coal at the pit's mouth, and to convey the energy electrically to each of many machines situated within a radius of, say, ten miles from the electric generating centre, or to load the coal on railway trucks, carry it in different directions to many factories, unload, stoke the furnaces at many places, and distribute the energy from the many steam-engines by shafting, belting, rope-gearing, compressed air, or an electric current generated at the individual factory?

At first sight one would be inclined to answer that without doubt the electric driving of individual machines over an area of, at any rate, fifty square miles from a single centre must be the cheaper. For can we not employ quite thin electric mains and still have only a small percentage loss of energy in transmission, by using a very high electric pressure and sending through the mains a comparatively small current, whereas we have no means of compressing coal, so that not merely its volume, but also its weight and its cost of transport, can be greatly diminished for a given amount of coal-energy conveyed? No doubt; but Great Britain has its Board of Trade, and that body not unnaturally looks with disfavour on the overhead wires in Western America, which are maintained at so high an electric pressure that it is only the spitting and brush-discharge that occurs which prevent a higher pressure being employed. For that is how the commercial limit of 40,000 volts has been arrived at in the United States for overhead electric transmission of energy.

Eleven thousand volts is the highest potential difference that has hitherto been allowed—even for buried conductors—by our Board of Trade, and even that pressure has been employed in connection with only two systems of transmission, viz. the one from the London Electric Supply Company's generating station at Deptford to their transforming stations at Trafalgar Square, Bond Street, &c., and the other from the Metropolitan Electric Supply Company's new generating station at Willesden to their transforming stations at Amberley Road, Manchester Square, &c.

The promoters of the four Power Bills, therefore, do not contemplate using at the outset a higher pressure than 10,000 volts, or sending more than 1000 kilowatts—that is, 1340 horse-power—through a single underground cable. The evidence as to the cost of such a cable showed that it could be made and laid for something like 1400*l.* a mile; some of the witnesses said 1000*l.*, while others thought that was a "promoter's figure," since they had not succeeded in getting similar cables constructed and laid in trenches in their own districts under 1800*l.* a mile.

It is well known that the relatively high price of electric-lighting arises from the small fraction of the twenty-four hours during which there is any great demand for electric energy, so that it is necessary to fit up in an electric-light central station engines and dynamos which can develop something like ten times as much horse-power as would be necessary to deliver the same total amount of electric energy in the twenty-four hours if the demand were a steady one. This is expressed by saying that the "load factor" is 10 per cent. In one or two English towns the load factor is actually as low as 6, and in very few cases is it higher than 12 per cent.

Now it was urged that if an electric generating station, instead of supplying current simply for electrically lighting a single town, were to supply electric energy for all sorts of purposes throughout a large district, the load factor would be very much higher, and the cost of production would be proportionately diminished. For example, with electric tramway work the load factor is about 40 per cent., that is to say, about 40 per cent. as much electric energy is used by the cars as could be produced by all the engines and dynamos in the tramway station if they were working at full load continuously day and night. With factories again, it was estimated that a load factor of some 30 per cent. might be obtained. Hence it was urged that one of these large electric power stations might rely on a load factor of about 25 per cent.

With this load factor of 25 per cent., it was estimated by Mr. Ferranti, for example, that if a generating station were erected in the coal-fields at a spot with a good supply of water for condensing the steam, and if the plant capacity were about 16,000 horse-power—of which 4000 would be kept as a reserve—the entire cost of generating a Board of Trade unit would be about 0.44*d.*, and the cost of transmitting it 0.2*d.* So that it could be sold to the consumer at 1.4*d.*, and a good business done, as contrasted with the 4*d.* or 6*d.* per unit now charged to private consumers in English towns.

As opposed to this, it was urged by central station engineers and others that this supposed great economy to be obtained by erecting electric generating stations at the pit's mouth and transmitting the energy electrically through considerable lengths of buried conductors was imaginary; that in towns like Manchester, Liverpool, Southport, Bolton, Cardiff, Newport, &c., electric energy for driving machinery was already offered to the public at as low a price as the promoters of these Bills proposed to offer it, that the fraction of the cost of delivering a Board of Trade unit which could be debited to the coal alone was small, and that the proportion arising from the mere cost of carrying the coal was still smaller.

As a matter of fact, although the average prices obtained for private electric lighting are 3.49*d.*, 4.04*d.*, 4.10*d.*, 4.68*d.*, 4.69*d.*, 5.29*d.* per Board of Trade unit by the Corporations of Manchester, Bolton, Southport, Cardiff, Liverpool and Newport respectively, any person in Manchester who desires to run an electro-motor, no matter how small it may be, during the whole of the ordinary factory hours, only pays now 1.4*d.* a unit to the Corporation. In Bolton he is charged 1.35*d.* if he takes his full demand for 640 out of the possible 2184 hours in a quarter. Southport charges the Tramway Company 1.4*d.* per unit. Cardiff offers the unit at 2*d.* if 4000 units are taken per annum—which means a single motor of only 1 horse-power running for about eight hours a day for 300 days in the year. The Liverpool Tramway Company pays the Corporation only 0.9*d.* per unit; while in Newport, 1.3*d.* is the price charged if more than 3000 units per quarter are taken.

The sweeping accusations, therefore, that some of the witnesses levelled against the local authorities of supineness, indifference to the public needs, &c., were

hardly borne out; while such evidence as that of the electrical engineer of Southport, that the carriage of coal to that borough increased the cost of the unit by only one-twelfth of a penny, and of the electrical engineer of Manchester, that the charge for interest on the cost of buried cables added 0.49*d.* to the value of the Board of Trade unit if it were transmitted twenty-five miles, whereas the cost of conveying the equivalent amount of fuel by railway over the same distance only increased the value of a Board of Trade unit of energy by 0.059*d.*, that is by only about one-eighth of the former, combined with the evidence that on the Continent and in America cheap overhead wire transmission was allowed, and therefore was generally adopted, led the Committee to realise the following, viz.:—that while the assent to the new proposals might confer a great boon on collieries and manufactories in scattered districts, a great wrong might be inflicted if safeguards were not introduced to prevent the introduction of the new electric schemes crippling the natural development of those systems of electric distribution which at present existed in this country, and which had been brought to their present condition by the expenditure of about 40 millions sterling during the past ten years.

In addition to the opposition to all the four Bills, made by private companies who had already obtained provisional orders to supply electrical energy, and by local authorities, some of whom had, and some of whom had not, obtained statutory powers to act as electrical suppliers, two of the Bills, viz. the Durham and the Tyneside, opposed one another. For whereas in the Durham Bill the district up to and including the south side of the Tyne is scheduled, in the other Bill both sides of the Tyne, from the mouth to Ryton, are included.

The promoters of the Tyneside Bill maintained that the two sides of the Tyne together naturally formed a single supply district, and that a company which had powers to supply the manufacturers on both sides with electric energy could do so more economically than if it was confined to the land along the north shore only. But they added that they had no objection to competition on the part of the proposed Durham Company or of any one else.

The Durham promoters urged that they were including in their area a lean portion towards the south of the county of Durham, which they could only undertake to supply if they were given the possession of the south bank of the Tyne undisturbed by competition on the part of the proposed Tyneside Company. It was also alleged that, although these various Bills passed their second reading because the President of the Board of Trade had stated that he had "an assurance from the promoters to the effect that they will undertake to agree to an amendment in Committee which would make it perfectly clear that they do not ask for the power to distribute even in bulk without the consent of the local authority," the Tyneside scheme really aimed at obtaining private way-leaves, and by skipping about the district by means of overhead wires to supply even private customers in retail without asking for the consent of any local authority. And it was pointed out that the assent to such a proposal would be manifestly unjust in view of the fact that those who were already supplying under "provisional orders," or who might obtain such orders, were compelled under the terms of such an order to supply every one within a certain "compulsory area" within a limited time, as well as being subject to comply with other obligations.

Serious opposition to the Tyneside Bill was also raised by the Newcastle Electric Supply Company. This is the company which for some years has been supplying electric current to the east of the district of Newcastle-upon-Tyne, but which, by arrangement with various local

authorities and with the Walker and Wallsend Union Gas Company—which obtained last year a Provisional Order for supplying electric energy to the districts of Wallsend and Willington Quay—has this session been promoting a Bill for distributing electric energy throughout a considerable area along the north of the Tyne to the east of Newcastle.

Between the proposed Tyneside Company and the existing Newcastle-on-Tyne Company a battle royal raged in the Committee Room, not merely because the area proposed by the one included that proposed by the other, but because a certain site on the Tyne bank was scheduled by both companies as the land on which they proposed to erect a generating station.

The advocates of the Tyneside Company, led by Lord Kelvin, asked, in fact, for authority to erect three generating stations—the one just referred to, one immediately opposite on the south bank of the Tyne, and one on the same bank, but much further west.

The advocates of the Newcastle-on-Tyne scheme, on the other hand, pleaded that the first site should be left to them, and urged, not unreasonably, that if the Tyneside Company confined its attention solely to that small bit which lay on the north bank of the Tyne to the west of Newcastle, of the whole of the area it contemplated, it would have ample scope for the spending of its entire capital, viz. a million sterling.

Indeed, one of the grounds of opposition to all the four large schemes before this Committee was that, while enormous areas were scheduled in the Bills, throughout which it was proposed to distribute electric energy, the capital asked for by any one of these companies was only a few hundred thousand pounds, or not more than a million, even when, as in the case of the Tyneside Bill, it was increased to that amount while the Bill was before the Committee. To this the advocates of these four Bills replied that the amounts put down for capital, even as increased during the progress of the Bills through Committee, were only intended to enable a start to be made, and that after a few years the companies would necessarily come to Parliament again for a large increase in capital. Further, that while it was proposed to start with erecting in each of the four districts a single 10,000 horse-power electric generating station, in a few years 50,000 or more horse-power would have to be electrically delivered in each of these districts if the Bills passed.

Excepting the Newcastle-on-Tyne Bill, which came before another Committee, the Lancashire Bill was the most moderate. On the other hand, the South Wales Bill was the most grasping, for it was the only one which professedly aimed at obtaining powers to invade a town and break up its streets without the consent and even against the wish of the local authority if the person whom the company aimed at supplying with electric energy was a "wholesale customer." And such a customer was defined in the Bill as one who was prepared to take 20,000 units a year.

Those who drafted this Bill no doubt were under the impression that there were very few people in the 1050 square miles of the counties of Glamorgan and Monmouth covered by this Bill who at present took more than 20,000 units a year. And no doubt that was the case, for only some six could be cited by those who represented the Corporations of Cardiff and Newport. But hitherto it has been almost exclusively for lighting that people in these boroughs have taken electric energy, and when from the electric supply systems of these Corporations, or from the mains of some outside company—should such a company gain access—manufacturers begin to receive current for working electro-motors, then a 20,000 unit customer would only pay 83*l.* 6*s.* 7*d.* a year for his energy, at 1*d.* a unit, and therefore in no sense could he come under the category of "wholesale."

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In fact, when the promoters of the South Wales Bill realised that even a 3 horse-power motor running continuously day and night—in connection, for example, with a blast furnace—would consume 20,000 units a year, and that a 9 horse-power motor working ten hours a day for 300 days in the year would require the same amount of electric energy, they saw that their "wholesale customer" would have to be thrown overboard.

In despair, however, the promoters still clung to the reed that a local authority could not if it would, and should not if it could, erect plant for supplying factories with electric energy on the large scale contemplated by these Electric Power Distribution Companies, and they urged that the ratepayers' money ought not to be used for speculative purposes, forgetful apparently that, even when a local authority has bought up an electric supply undertaking at twice the sum that it cost the private company to erect it, the rates have been ultimately relieved in consequence of the purchase, and the ratepayers therefore benefited by the local authority becoming a purveyor of electric energy.

Ultimately, on Wednesday, June 27, the chairman, Sir James Kitson, who it is important to remember is not merely an M.P., but what is far more important the head of a great manufacturing firm, a director of a great railway, and the ex-Mayor of a great city, made the following most excellent declaration:—

"A local authority which undertakes and is prepared to give a full and ample supply of electrical energy for all purposes to consumers within its district ought not, without its consent, to be required to give facilities for the supply, within its district, of electrical energy by other undertakers. But if a local authority is unable or unwilling to provide on reasonable terms and within a reasonable time a full and adequate supply of electrical energy for any purpose to any company or person applying for the same within its district, such company or person should be at liberty, after notice to the local authority, to obtain their supply from other authorised undertakers, and the local authority should be required to give all necessary facilities for this purpose. Any difficulty arising out of the above questions should be subject to arbitration as provided by the general Acts."

Doubtless this decision did not please all; but how acceptable was it to those who, like myself, have been hungering for the realisation of our dream of twenty-one years ago—"power brought to the workman, not the workman to the power"—but who have seen with apprehension the growth of obstacles nourished by England's spirit of masterly inactivity and by its not unnatural, nor wholly unwise, veneration of vested interests.

For now local authorities are put on their metal. If you realise, says Sir James Kitson's Committee, what are your duties in providing all your people with "an ample supply of electrical energy for all purposes," we will be no parties to any hindrance through competition being put in your way. But if your district be one in which bumbledon reigns supreme, then our declaration is that no municipal barrier shall be left standing to oppose the free entrance of those who come with offers of cheap electric energy.

Next, on Thursday, June 28, the formal statement was made by the Chairman:—"that the preamble of the South Wales Electrical Supply Bill is proved, also that the preamble of the Durham (County of) Electric Power Supply Bill is proved; and the preamble of the Tyneside Electric Power Bill is not proved to the satisfaction of the Committee, and that the preamble of the Lancashire Electric Power Bill is proved to the satisfaction of the Committee." Then followed the lengthy process of drafting the clauses, and finally, on July 16, these three Bills, of which the preambles had been reported by the Committee as proved, were read a third time in the House.

On the following day, the North Metropolitan Electric

Power Supply Bill, which asks for authority to supply electric energy over a smaller region, consisting of the districts of Hornsey, Hendon, Barnet, St. Albans, Hatfield, Hertford, Ware, &c., was, after being considered by another Committee of the House of Commons, read for a third time, and finally, on Tuesday, July 24, the Newcastle-on-Tyne Electric Supply Companies scheme already referred to in this article received the sanction of a Committee of the House of Lords.

The era of Electrical Power Distribution on a vast scale in our country has, therefore, begun.

W. E. AYRTON.

#### THE DAILY WEATHER REPORT OF THE METEOROLOGICAL OFFICE.

THE Meteorological Council has made provisional arrangements for the sale of single copies of the Daily Weather Report at a penny each from the first of August next. The copies will be on sale from about 3 o'clock of the afternoon of the day of issue at the Meteorological Office and at the railway bookstalls of the following terminal railway stations in London: Victoria (S. E. & C. and L. B. & S. C.), Charing Cross, St. Pancras, King's Cross and Euston. Hitherto the issue of the reports has been confined to certain public offices and institutions, and to annual or quarterly subscribers. The distribution has been by hand or by book-post. The area within which delivery can be effected on the day of issue is necessarily very limited, and it is hoped that the facilities afforded by the new arrangement may bring the information which the reports contain within the reach of some of those interested in the subject who live outside the present limits of delivery on the day of issue. If the provisional arrangement should make it apparent that there is any public demand for the accommodation, efforts will be made to continue and extend it.

From the same date some modifications will be introduced into the form of the Report. The morning and evening observations of the telegraphic reporting stations will appear on the first page as usual, but the two charts on the second page, representing the morning distribution of pressure, wind and sea, and of temperature and weather respectively, will be supplemented by three smaller charts. One will represent the barometric distribution over the whole of Europe at 8 a.m. of the preceding day in order that the general atmospheric changes may be more readily traced. Another will represent mean monthly or bi-monthly morning isotherms for the British Isles, so that the distribution of temperature for the day may be easily compared with the normal distribution for the season as estimated for a period of twenty-five years. The third will represent the distribution of mean maximum temperature estimated in a similar manner.

There will also be several changes on the fourth page of the Report. Instead of "General Remarks on the Weather over Europe" there will be a table giving the latest information in the possession of the Office as to maximum and minimum temperature, rainfall, and weather at selected stations on the Continent and elsewhere which are beyond the area represented by the telegraphic reports. The selection of the stations will be mainly determined by the current interests of travellers, and will be varied from time to time according to the information available.

The information as to the weather in the British Islands will also be supplemented by data as to sunshine for the preceding day from a number of stations which will report by post, and it is intended, in course of time, to replace "yesterday's 2 p.m. reports" by postal reports of maximum and minimum temperature and rainfall for a number of inland stations which are expected to prove

a useful addition to the telegraphic reports of the first page.

For convenience of reference a small supplemental table will give the Greenwich time of sunrise, noon, and sunset for four selected stations in the British Isles, so that the variation in the duration of daylight and the standard times of local noon for any locality may be ascertained.

W. N. SHAW.

#### THE BRADFORD MEETING OF THE BRITISH ASSOCIATION.

THE local arrangements for the Bradford meeting of the British Association in September next are now rapidly approaching completion. The railway companies have agreed to give the usual special facilities, both to visitors who come to Bradford from long distances, and to members resident in Yorkshire who travel to and fro every day. Those persons who attend the meeting can obtain a return ticket from nearly all the railway companies at a fare and a quarter, provided they present to the booking-clerk a certificate, which can be obtained on application to the local office at 5, Forster Square. Any Members or Associates visiting Bradford day by day, and staying in places within fifty miles of the city, can obtain return tickets at the single fare on presenting their card of membership to the booking-clerk in Bradford. The following railway companies have entered into this arrangement:—the Caledonian, the Great Eastern, the Great Central, the Great Northern, the Great Western, Lancs. and Yorks, London, Brighton and South Coast, London and North Western, London and South Western, Midland, North British, North Eastern, South Eastern, Chatham and Dover, and the other companies belonging to the Associated Railways.

The local programme is now in the press, and will be issued within the next fortnight to the Members and Associates who have notified their intention of being present. The following items, however, will give a brief summary of the information contained in it:—

#### GENERAL PROGRAMME.

*Wednesday, September 5.*—4 p.m.: Meeting of General Committee at the Town Hall; 8.30 p.m.: the President's Address in St. George's Hall.

*Thursday, September 6.*—3.30 p.m.: Reception at the Technical College (Textile Exhibition); 8.30 p.m.: the Mayor's Conversazione in St. George's Hall.

*Friday, September 7.*—8.30 p.m.: Lecture in St. George's Hall by Prof. Gotch, F.R.S., on "Animal Electricity"; 9.30 p.m.: Smoking Concert in the Technical College in honour of the President.

*Saturday, September 8.*—Excursions (half-day); 8 p.m.: Artisans' Lecture in St. George's Hall, by Prof. Silvanus Thompson, F.R.S.

*Sunday, September 9.*—10.30 a.m.: Sermon by the Bishop of Ripon in the Parish Church.

*Monday, September 10.*—3.30 p.m.: Corporation Garden Party in Lister Park; 8.30 p.m.: Lecture in St. George's Hall by Prof. W. Stroud, D.Sc., on "Range Finders."

*Tuesday, September 11.*—8.30 p.m.: Corporation Soirée in St. George's Hall.

*Wednesday, September 12.*—3.30 p.m.: Private Garden Parties; 8 p.m.: Full-Dress Concert in St. George's Hall (Festival Choral Society; Permanent Orchestra; conductor, Mr. F. H. Cowen; Miss Ella Russell).

*Thursday, September 13.*—Excursions (whole day).

The conferences of delegates of corresponding societies will be held on Thursday, September 6, and Tuesday, September 11, at 3 p.m., at the Reception Rooms.

The Reception Room at the Grammar School will be opened on Monday, September 3, at 2 p.m. to 6 p.m.,